

REMARKS

In paragraph two, the Office Action requested the affirmation of the election of species B (claims 27-35). Applicants hereby affirm the election of Species B and cancel claims 1-26 and 36-39 without prejudice in order to prosecute those claims in a divisional application.

In paragraph five of the Office Action, claims 27 and 29 were rejected under 35 U.S.C. §112, first paragraph. Specifically, the Office Action states that the specification enables the filling of the tank with liquid as recited on page 15, lines 9-15, it does not reasonable provide enablement for the term "filling the tank with a fluid". Applicants believe that the specification enables a person skilled in the art to practice the invention with respect to the scope of claims 27 and 29. Applicants cite, as a few examples, the following:

As a first aspect, the present invention is related to a method of removing organic contaminants from a substrate comprising the steps of holding said substrate in a tank, and filling said tank with a gas mixture comprising water, ozone and an additive acting as a scavenger. The term tank for the purpose of this and related patent applications is meant to cover any kind of tool or reaction chamber wherein substrates are held for the purpose of cleaning or removing organic contamination. Thus the term tank is to cover tools or reaction chambers known in the art such as wet benches, vessels, spray processors, spinning tools, single tank and single wafer cleaning tools.

As a second aspect, the present invention is related to a method for removing organic contaminants from a substrate, comprising the steps of:

holding said substrate in a tank;

filling said tank with a liquid comprising water, ozone and an additive acting as a scavenger; and

maintaining said liquid at a temperature less than the boiling point of said liquid.

As a third aspect, the present invention is related to a method for removing organic contaminants from a substrate comprising the steps of:

holding said substrate in tank;

filling said tank with a fluid comprising water, ozone and an additive acting as a scavenger, and wherein the proportion of said additive in said fluid is less than 1% molar weight of said fluid.

Page 9, lines 10 – page 10, line 8.

According to a preferred embodiment, the method can also comprise the step of filling said tank with a liquid or a solution comprising essentially water and said additive,

the solution level in said tank remaining below the substrate and wherein said solution is heated.

Page 15, lines 9-13. Therefore, applicants believe that the specification sufficiently enables one skilled in the art to practice the invention as claimed in claim 27 and 29.

In paragraph seven of the Office Action, claims 27-28 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sakon et al. (U.S. Patent No. 5,560,857) in view of Kern (Hand Book of Semiconductor wafer cleaning technology) and further in view of Sehested et al. (J.Phys.Chem.). The Office Action states that the Sakon reference discloses a cleaning solution comprising an aqueous solution containing hydrogen peroxide and additives such as acetic acid. The Office Action states that the Sakon reference does not teach the use of acetic acid as a scavenger but that it would have been obvious that the acetic acid acts as a scavenger since it is a well known stabilizer of aqueous ozone, as taught by Sehested et al. The Office Action further states that it would have been obvious to replace hydrogen peroxide with ozone because both are functionally equivalent, as taught by Kern.

In one aspect, the current invention discloses a process wherein ozone in combination with a scavenger removes organic contamination on a substrate. Applicants do not believe that the reference alone, or taken in combination, render the claims as written obvious.

The Sakon reference, in combination with the Kern, and Sehested references, do not render the current invention obvious for several reasons. First, the Sakon reference is directed to a different problem. Sakon et al. disclose a process for cleaning a semiconductor substrate and silicon oxides. The solution in Sakon is used for reduction of metallic contamination and for particles adhered on the surface. The cleaning solution contains HF, H₂O₂ and H₂O. HF is used for the etching properties, since a small amount of the silicon or silicon oxide layer will be etched

away. This is typical for cleaning of silicon or silicon oxide surfaces. H₂O₂ is used for the oxidizing properties. It is generally known in the art that cleaning solutions for cleaning silicon substrates are different from cleaning solutions for organic material removal. Thus, the present invention is directed toward a different problem addressed in Sakon. Second, as noted in the Office Action, Sakon does not disclose the use of ozone, but instead discloses hydrogen peroxide. Third, Sakon discloses the use of acetic acid but for an entirely different purpose – not for use as a scavenger. In the present invention, the aim of adding an additive acting as scavenger is to reduce the amount of free OH radicals, such that the decomposition of O₃ is more controlled. A scavenger is a compound that counteracts the unwanted effects of another compound being present in the solution. Thus, the present invention as claimed includes a “scavenger” in combination with “ozone,” neither of which is disclosed in Sakon.

In paragraph eight of the Office Action, claims 29-33 were rejected under 35 U.S.C. §103(a) as being unpatentable over Ohmi et al. (“Native Oxide Growth and Organic Impurity Removal on Si Surface with Ozone-Injected Ultrapure Water”) in view of Heyns et al. (“New Wet Cleaning Strategies For Obtaining Highly Reliable Thin Oxide”). In paragraph nine of the Office Action, claims 29 and 34-35 were rejected under 35 U.S.C. §103(a) as being unpatentable over Heyns et al. in view of Sakon et al. and further in view of Sehested et al. (J.Phys.Chem.)

To better define the invention, applicants have added the limitation of the “fluid mixture comprising . . . an additive acting as a scavenger” in claim 29. Neither the Heyns nor the Sakon reference disclose, or even suggest, the use of an additive acting as a scavenger in combination with ozone. As detailed above, this renders the claimed invention novel over the cited art.

In paragraphs eleven, thirteen and fourteen of the Office Action, claims 27-28 were provisionally rejected as claiming the same invention as claims of copending Application Serial No. 09/207,546. Upon allowance of claims in the present cases, applicants will submit a terminal disclaimer.

CONCLUSION

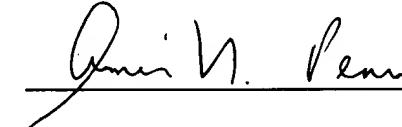
If for any reason, the application is not considered to be in condition for allowance on the next Office Action and an interview would be helpful to resolve any remaining issues, the Examiner is requested to contact the undersigned attorney at (312) 913-0001.

Respectfully submitted,

McDonnell Boehnen Hulbert & Berghoff

Dated: January 29, 2001

By:



Amir N. Penn
Reg. No. 40,767
Attorney for Applicant